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# Management Practices Considerations

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# Management Practices Considerations

## **Abstract**

The variability in regional soil and climate conditions are key factors in selecting any management practices including tillage and cropping systems that will ultimately influence soil health and crop response. Crop response to tillage systems has been demonstrated to be different for the same tillage system in different parts of the state or regions elsewhere. Different tillage systems affect soil temperature, soil moisture conditions, soil compaction, soil productivity, nitrogen movement and N availability differently. These effects will be reflected in soil's biological, chemical and physical properties optimum functions or soil health and will subsequently affect productivity. Management practices include many tools we use to manipulate soil conditions such as soil temperature specifically in poorly drained areas where it plays a significant role in early seed germination, organic N mineralization, nutrient and residue incorporation, and weed and pest control.

## **Keywords**

Agronomy

## **Disciplines**

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## Management Practices Considerations

By Mahdi Al-Kaisi, Department of Agronomy

The variability in regional soil and climate conditions are key factors in selecting any management practices including tillage and cropping systems that will ultimately influence soil health and crop response. Crop response to tillage systems has been demonstrated to be different for the same tillage system in different parts of the state or regions elsewhere. Different tillage systems affect soil temperature, soil moisture conditions, soil compaction, soil productivity, nitrogen movement and N availability differently. These effects will be reflected in soil's biological, chemical and physical properties optimum functions or soil health and will subsequently affect productivity. Management practices include many tools we use to manipulate soil conditions such as soil temperature specifically in poorly drained areas where it plays a significant role in early seed germination, organic N mineralization, nutrient and residue incorporation, and weed and pest control.

Selecting these management practices are some of several decisions farmers have to make. However, there are many other factors that need to be considered when selecting a management practice such as tillage system or crop rotation for any given field or region within the state. Those factors are soil conditions, which include soil slope, soil drainage, topsoil depth or the A-horizon depth, soil texture, etc. Others are equally important factors that need to be considered including hybrid selection, crop rotation and management factors such as residue cover, type of residue (corn or soybean), soil moisture condition at the time of making the decision, timing of tillage operation, fertilizer management in conjunction with tillage operation, type of residue management equipment, planting and harvesting equipment, compliance with conservation plans, and, above all, the economic return and benefits for selecting a certain practice.

Understanding the site-specific effect of those management practices (i.e. tillage, crop rotation, cover crops, etc.) can significantly help in reducing input cost and also reduce the negative impact on soil health, water, and air quality. Conservation tillage systems continue to be a very important component of crop production systems in terms of economic return and environmental benefits. However, the challenges in managing such systems, notably no-tillage, are related to proper management practices that are associated with drainage in poorly drained soils, the use of residue management attachments, seeding depth and fertilizer management. Also, the timing of field operations including N application, manure injection, etc., has to be done when the soil moisture condition is suitable (below field capacity) to avoid any serious soil compaction problems.

Soil moisture and temperature conditions in the seedbed zone (top 2-6 inches) can promote or delay seed germination and plant emergence. However, soil temperature and moisture can be affected by surface residue cover, which can cause cooler soil surface temperature and slower soil drying in the spring despite its value in reducing soil erosion and surface runoff. Any soil disturbance during the tillage process and the incorporation

of residue increases soil aeration, leading to moisture evaporation and increase in soil temperature. This process impacts soil organic C and N mineralization and N availability for plant use.

In summary, management practices that protect soil health and sustain productivity are economically and environmentally necessary. The implementation of such practices should be considered on a regional and site-specific basis. Site-specific adoption of different tillage and conservation practices is essential to achieve intended objectives that can be easily integrated within an overall production system. These conservation plans can include, but are not limited to, no-till, strip-tillage, cover crop, perennials, grass waterways, terraces, buffer strips, pasture for erosion control, manure application plan, and soil testing. Conservation planning and implementation of such practices need to be considered carefully as solutions to reduce potential row cropping system effects on soil health and water quality. Consideration of site specifics and objectives of implementing conservation practices should be included in the planning process. Finally, conservation practices must be an integral and essential component of nutrient and sediment loss reduction plans as an effective solution to protecting soil health and water quality.

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